Characterization of a Controlled-Release Formulation of Novaluron

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Introduction

- Insecticides are used to control mosquitos, which are vectors of disease; however, repeated application of these insecticides has led to resistance [1]
- Novaluron (Figure 1), a member of the benzoylphenyl urea family of insecticides, has a different mechanism of action from other insecticides and can inhibit the emergence of mosquito adults at low concentrations (0.144 µg/L-*Aedes aegypti* and 0.604 µg/L-*Culex quinguefasiatus*) [2,3]
- Rimon EC10 is a formulation of novaluron currently registered for mosquito control in standing water; EC10 inhibited the emergence of mosquito adults (*Aedes aegypti)* in standing water test systems for 14 weeks [4]
- A new formulation of novaluron was developed by Tumaini (CRT) Inc. to extend the duration of mosquito control and increase the ease of application
- This new wax-based formulation has been developed to regulate and increase the duration of release of its active ingredient (a.i.) in standing water. In test studies this formulation was detectable at levels that inhibit the emergence of mosquito adults after 6 months
- In the same test studies, organic matter (rabbit food) added to the test system reduced the amount of detectable novaluron in water

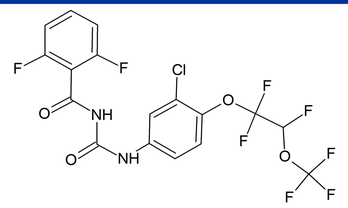

Figure 1: Novaluron (trade name: Rimon)

Objectives

- Determine the effectiveness of novaluron release from the controlled release formulation (CRF) manufactured by Tumaini (CRT) Inc. at two distances from the point of treatment
- Investigate the effect that added sediment (high in organic matter) has on available novaluron from the CRF
- Verify that the applied doses of novaluron inhibit the emergence of mosquitos through bioassay

Materials and Methods

- Fifteen mesocosms at the Guelph Turfgrass Institute were used (5 treatments with 3 replicates each)
- The treatments were:
  - Label rate (with 0.48% a.i.) with and without added sediment
  - One quarter label rate (0.12% a.i.) with and without added sediment
  - Control (formulation without a.i.) with added sediment

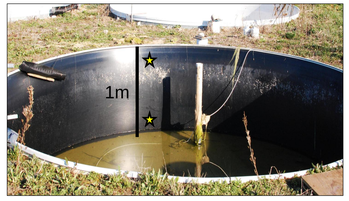

Figure 2 – an empty mesocosm container, sampling depths are indicated with a "☆"

Figure 3 – a full mesocosm with sediment added, each mesocosm contains about 12 000L of water

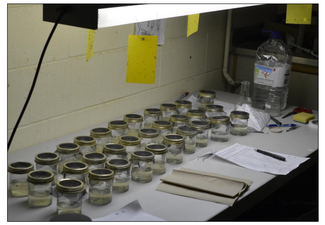

Figure 4 – the mosquito bioassay area at 25ºC; with a 16:8 light:dark cycle

- Mesocosms were set-up, dosed with CRF and monitored for 130 days
- Each mesocosm was sampled at two different depths (0.1 m and 0.9 m)
- Samples were concentrated by C18 solid phase extraction and analyzed by HPLC-UV. The method detection limit was 0.36 µg/L
- Bioassays used 4th instar *Aedes aegypti* larvae with 20 larvae in each water sample

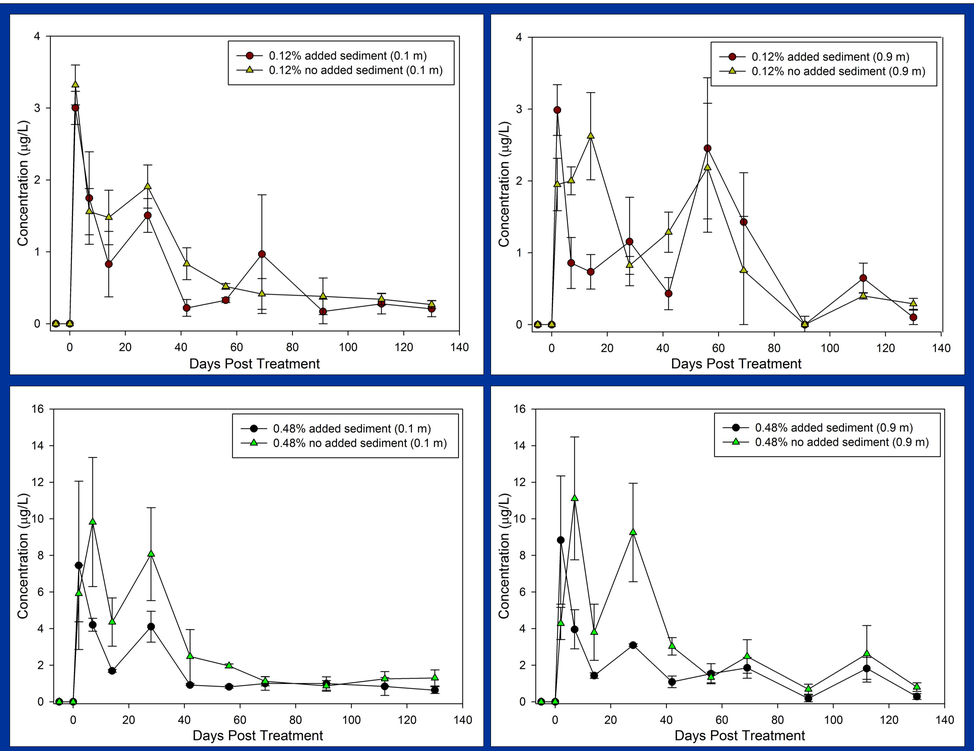

Figure 5: Concentration of novaluron (µg/L) in water samples withdrawn from mesocosms

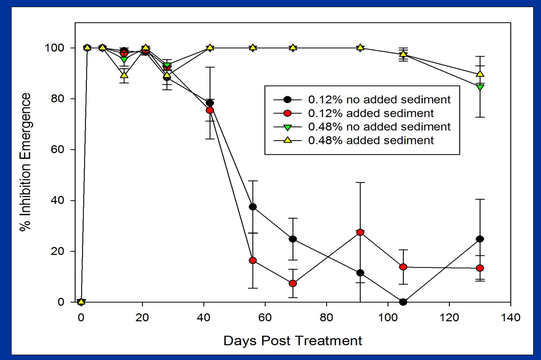

Figure 6: Inhibition of emergence (%) of pooled novaluron treatments

Results and Discussion

- Though detection of novaluron by HPLC-UV was possible throughout the study, some samples were below the method detection limit by the end of the study
- The novaluron in the CRF was evenly distributed by day 2 for all treatments
- Added sediment did not have an appreciable effect on the concentration of novaluron in water samples
- The 0.12% novaluron CRF caused over 90% inhibition of emergence in *Aedes aegypti* for 28 days, while 0.48% novaluron CRF caused over 90% inhibition of emergence for 105 days
- A more sensitive analytical method would improve novaluron quantification (e.g. ELISA or MS), this is needed for environmental monitoring
- Bioassays will be conducted in spring 2012 to determine the effect of over-wintering on mosquito control

Acknowledgement

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